REMARKS/ARGUMENTS

Claims 1-21 were pending. Claims 1-21 were variously rejected under 35 USC §102(b) and 35 USC §103(a) in light of Gagne.

I. THE PRESENT INVENTION

Embodiments of the present invention relate to methods and apparatus for squash and stretch of multiple objects.

As was disclosed in the background of the invention, a problem with conventional squash techniques was that groups of objects were not "properly" squashed. For example, as illustrated in Fig. 1A, when the arm is squashed, or foreshortened, the resulting arm in Fig. 1B is not aesthetically squashed. As can be seen in Fig. 1B, the elbow maintains its size, while the same type of deformation is applied to the upper portion of the arm and the lower portion of the arm.

In contrast, as illustrated in Figs. 7A and 7B, when the arm in Fig. 7A was squashed, objects making up the arm were squashed as illustrated in Fig. 7B. As seen in Fig. 7B, the elbow was not constrained to maintain its size and the upper portion of the arm reacts differently from the lower portion of the arm. This is because the squash was performed for the entire arm object and not to the separate components.

As another example, as illustrated in Fig. 1A, when the arm is stretched, or lengthened, the resulting arm in Fig. 1C is not aesthetically stretched. As can be seen in Fig. 1C, the elbow again maintains its size, while the same type of deformation is applied to the upper portion of the arm and the lower portion of the arm.

In contrast, as illustrated in Figs. 7A and 7C, when the arm in Fig. 7A was stretched, the objects making up the arm were stretched as illustrated in Fig. 7C. As seen in Fig. 7C, the elbow was not constrained, because the stretch was performed for the entire arm object and not to the separate components.

As can be determined from the above, in various embodiments, when the squetching functions are applied, they are applied to the group of objects as a whole, and not separately or individually to the objects in the group. As a result, the group of objects squetch in a more pleasing manner as illustrated in Fig. 7B and Fig. 7C. Various embodiments of the present invention, disclose that the group of objects can be constrained, steps 230 and 260, Fig. 3A to provide this functionality.

Claim 1, as amended recites, displaying a first three-dimensional object and a second three-dimensional object on a display, wherein a three-dimensional object comprises the first three-dimensional object and the second three-dimensional object, wherein the third three-dimensional object has an associated first volume. Claim 1 also recites determining a constraint for the third three-dimensional object, wherein the constraint is not applied to the first three-dimensional object and is not applied to the second three-dimensional object.

II. GAGNE

Gagne relates to simulating the effects of motion via graphic object deformation.

Gagne discloses two situations where multiple objects may be deformed. One is where a child object inherits its parents deformation parameters, and one is where a child object operates independently of its parents deformation parameters. More specifically, Gagne describes a child object inheriting parent's parameters:

> *An object that is deformed using the QSTRETCH module can be part of another object. ... Thus, an object may be a "child" of a "parent object," which may in turn be a child of another parent object. Characteristics of the child object are inherited from the parent object. Col. 6, lines 41-49.*
>
> *If check box 166 is not selected, the parent object's QSTRETCH setup (if any) is used instead, and the deformation is performed considering all of the object's control vertices, relative to the parent object's center. Col. 9, lines 18-21.*

Gagne also describes a child object having parameters independent of the parent:

> *For example, using the QSTRETCH module, a bat held by an animated character can be deformed, independently of the arms of the character swinging the bat ... However, the parameters applied by the QSTRETCH module for deforming an object can be selectively set so the QSTRETCH module uses the object's own parameters instead of the parameters of the parent object. col. 6, lines 42-53.*
>
> *As noted above, the user can optionally override the QSTRETCH setup parameters applied to a parent object for which the currently selected object is a child. A check entered within a check box 166 causes the object to deform as if it were a node without any parent, regardless of whether the parent has the QSTRETCH function applied to it or not. Col. 9, lines 13-17.*

As can be seen, Gagne states that in one case, a child object will "inherit" the parent's parameters, which includes the motion vector input and other setup parameters illustrated in Fig. 6B. As an example, if a parent object specifies a deformation limitation such as a curved profile, the child would also inherit the deformation limitation of a curved profile.

As can be seen, Gagne states that in the other case, a child object will be treated separately from the parent. As noted in the quotation above, the bat is deformed independently of arms of a character. Accordingly, in Gagne, the child object uses a separate motion vector input and its own setup parameters, as a result of selection checkbox 166.

III. GAGNE DISTINGUISHED

A. Claim 1

Claim 1 is not anticipated or obvious in light of Gagne. More specifically, Gagne fails to disclose the limitations of: displaying a first three-dimensional object and a second three-dimensional object on a display, wherein a three-dimensional object comprises the first three-dimensional object and the second three-dimensional object, wherein the third three-dimensional object has an associated first volume, and the limitation of determining a constraint for the third three-dimensional object, wherein the constraint is not applied to the first three-dimensional object and is not applied to the second three-dimensional object.

In contrast, Gagne merely describes in one case that the limitations of a parent can be inherited by a child. Accordingly, if a parent deformation is curved, the child deformation can also be curved. The result of the description of Gagne appears to be the same as was disclosed in the background of the invention in Figs. 1B and 1C. For example, in Fig. 1B, it can be seen that the profile of the upper forearm and the lower forearm are both convex in the same manner, and in Fig. 1C, it can also be seen that the profile for the upper forearm and the lower forearm are both concave in the same manner. Further, in the other case described in Gagne the parent and child are independent and can be modified separately from one another. Thus, the motion vector input for the parent is not applied to both the parent and the child at the same time. Instead, Gagne appears to disclose a first motion vector may be applied to the parent, and a second, separate, motion vector may be applied to the child.

In either case, Gagne fails to disclose a constraint applied to the third three-dimensional object, but not to the first or to the second three-dimensional object, as recited properly above.

Because all the limitations of claim 1 are not taught, suggested or disclosed by Gagne, claim 1 is asserted to be allowable.

B. Remaining claims

Claims 10 and 17 are asserted to be allowable for substantially the same reasons as claim 1, and more specifically, for the specific limitations they recite.

Claims 2-9, dependent upon claim 1, are also asserted to be allowable for substantially the same reasons as claim 1, and more specifically, for the specific limitations they recite.

Claims 11-16, dependent upon claim 10, are also asserted to be allowable for substantially the same reasons as claim 10, and more specifically, for the specific limitations they recite.

Claims 18-21, dependent upon claim 17, are also asserted to be allowable for substantially the same reasons as claim 17, and more specifically, for the specific limitations they recite.

CONCLUSION

In view of the foregoing, the Undersigned believes that all of the issues raised by the Examiner have been responded to by this response. Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (650) 326-2400.

Respectfully submitted,

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